

**DICTYLA ECHII: SEASONAL HISTORY AND NORTH AMERICAN
RECORDS OF AN IMMIGRANT LACE BUG
(HEMIPTERA: TINGIDAE)**

A. G. WHEELER, JR. AND E. RICHARD HOEBEKE

Bureau of Plant Industry, Pennsylvania Department of Agriculture,
Harrisburg, Pennsylvania 17110 and
Department of Entomology, Cornell University,
Ithaca, New York 14853

Abstract.—*Dictyla echii* (Schrank), a Palearctic lace bug associated with boraginaceous plants, has been recorded previously in North America from Maryland, Pennsylvania, Virginia, and West Virginia; additional records are cited for these states, and new records are given for New York and Ohio and for Ontario, Canada. The seasonal history and habits of *D. echii* on viper's bugloss or blueweed, *Echium vulgare* L., in southcentral Pennsylvania are presented. A diagnosis of the adult and a summary of its habits in the Old World are provided.

The lace bug *Dictyla echii* (Schrank), placed in the genus *Monanthia* LePeletier & Serville until Drake and Ruhoff (1960) resurrected *Dictyla* Stål, is indigenous throughout much of the Palearctic Region. It ranges from Portugal and Spain north to Scandinavia and Siberia, and south to northern Africa, Iran, Turkestan, and China; it is absent from Great Britain (Drake and Ruhoff, 1965; Jing, 1981). This specialist on plants of the Boraginaceae is especially common on species of *Anchusa*, *Cynoglossum*, *Echium*, *Pulmonaria*, and *Symphytum* (Gulde, 1938; Stichel, 1960); Drake and Ruhoff (1965) give a list of known European hosts.

Adults overwinter in the soil near rosettes of *Echium vulgare* L., one of its preferred hosts (Vayssieres, 1983), or occasionally in empty galls made by the phylloxeran *Tetraneura ulmi* (L.) (Stichel, 1960). In spring, eggs are deposited in stems, petioles, and principal veins of host foliage (Štusák, 1958; Vayssieres, 1983). Adults and nymphs feed on rosettes and flower shoots, causing a chlorotic appearance of foliage, stunted floral shoots and, in heavy infestations, a decrease in seed production. Several generations are produced annually (Vayssieres, 1983). Štusák (1958) and Puchkov (1974) described the egg with the latter work containing an illustration, Stusak (1957) and Cobben (1958) described and figured the fifth-instar nymph, and Puchkov (1974) and Vayssieres (1983) provided an illustration of the fifth instar and the adult.

The first records of this lace bug's establishment in the Western Hemisphere were based on specimens collected in 1959 at several localities near Harrisburg, Pennsylvania (Udine, 1962). Hambleton (1968) gave the first records of *D. echii* from Maryland, Virginia, and West Virginia and noted that it had been taken at Miami, Florida, in 1944. Because this latter record was not stated to represent a port interception, Slater and Baranowski (1978) cited Florida as part of the known North American range. The Miami record, however, was based on a live specimen collected in an airplane that had arrived from a foreign country (Drake Collection in U.S. National Museum of Natural History).

Hambleton (1968) also reported that *D. echii* occurs on *Echium vulgare*, a naturalized European plant known as viper's bugloss or blueweed. This biennial weed often colonizes disturbed sites such as road embankments, railroad right-of-ways, and overgrazed pastures, especially in limestone regions (Pusateri and Blackwell, 1979). Two other recent immigrants from the Old World are associated with *E. vulgare*: the megachilid bee *Hoplitis anthocopoides* (Schenck) (Eickwort, 1971, 1973) and the gelechioid moth *Ethmia bipunctella* (F.) (Oecophoridae) (Heppner and Powell, 1974). Eickwort noted that the arrival of an oligotrophic bee of *E. vulgare* provided an excellent opportunity to follow the spread of an exotic insect under nonagricultural conditions. Here, we document the range expansion of *D. echii* on *E. vulgare* in eastern North America, giving New York and Ohio as new state records, listing additional localities for Maryland, Pennsylvania, Virginia, and West Virginia, and providing the first Canadian records (Ontario). We also give information on its seasonal history and habits and provide a diagnosis and an illustration of the adult.

MATERIALS AND METHODS

As part of survey and detection work on immigrant insects in eastern North America (Hoebeker and Wheeler, 1983), we checked numerous stands of *E. vulgare* for the presence of *D. echii*. Voucher material from our surveys is housed in the insect collections of Cornell University and the Pennsylvania Department of Agriculture. Records from Albany Co., New York from G. C. Eickwort's study of *Hoplitis anthocopoides* were obtained from undetermined specimens in the Cornell collection.

Seasonal history of *D. echii* was followed by sampling a roadside colony of *E. vulgare* near Harrisburg, Pennsylvania. The plants were growing at the base of a slope planted with crownvetch (*Coronilla varia* L.) that was not mowed. Collections and observations were made every 6–8 days from 27 April to 5 August 1981 and then periodically until plants dried up (usually mid- to late August). Early-season observations were made in May and June 1982. On each sample date, plant material was collected and examined in the laboratory for eggs, and all stages of *D. echii* present were recorded; when nymphs were found, a random sample of 10 was collected and sorted to stage in the laboratory. Nymphs of all stages often occurred on the plants, sometimes in aggregations of a particular instar. Therefore, additional observations were made to determine the presence of nymphal stages that might not be represented in the sample of 10. Nearby colonies of *E. vulgare* exhibited somewhat different phenologies, especially when regular mowing prolonged the normal flowering period. Collections and observations were made periodically from several of these colonies during 1981 and 1982.

NORTH AMERICAN DISTRIBUTION

In addition to the published records of *D. echii* from Pennsylvania (Dauphin Co.) (Udine, 1962) and Maryland (Frederick and Montgomery Co.), Virginia (Clarke and Loudoun Co.), and West Virginia (Jefferson Co.) (Hambleton, 1968), the following records are available. Unless noted otherwise, all records are based on the authors' collections from *Echium vulgare*; note the collection from *Cynoglossum officinale* L. in Erie Co., New York.

UNITED STATES. **Maryland:** *Garrett Co.*, Rt. 48, 3 mi E of Grantsville, 25 June 1981. *Washington Co.*, Rt. 63 nr. Williamsport, 14 Aug. 1982. **New York:** *Albany Co.*, Rensselaerville, 17 July 1969, G. & K. Eickwort coll.; 4 June 1970 and 29–30 June 1975, G. C. Eickwort coll. *Broome Co.*, Binghamton, 23 July 1983. *Cayuga Co.*, Auburn, 26 June 1982. *Chemung Co.*, Elmira, 18 July 1981. *Cortland Co.*, Cortland, 11 July 1981. *Erie Co.*, Tonawanda, 31 Aug. 1980; 14 June 1981, on *Cynoglossum officinale*. *Madison Co.*, Rt. 20, 1.3 mi W of Oneida Co. line, 30 June 1984. *Onondaga Co.*, Solvay, 26 June 1982 and 14 May 1983. *Wayne Co.*, Lyons, 31 July 1981. **Ohio:** *Stark Co.*, Louisville, 4 July 1982, K. Valley coll. **Pennsylvania:** *Bedford Co.*, nr. Schellsburg, 2 July 1980. *Berks Co.*, Rt. 78, 1 mi W of Rt. 737 nr. Kutztown, 14 July 1981. *Blair Co.*, Rt. 22 at junc. Rt. 866 nr. Williamsburg, 17 July 1973 and 14 May 1981. *Centre Co.*, State College, 23 July 1980 and 26 Aug. 1981. *Clearfield Co.*, Clearfield and Philipsburg, 26 Aug. 1981. *Cumberland Co.*, nr. Newville, 16 May 1972, T. J. Henry coll.; Rt. 11 nr. Carlisle, 17 Apr. 1974, on *Pinus virginiana*; Rt. 641, 2 mi E of Newburg, 5 May 1973, on *Pinus virginiana*; PA Turnpike, 9 mi W of Rt. 997, 2 July 1980; Enola railroad yards, 10 Aug. 1980 and 5, 27 May 1981. *Dauphin Co.*, Rt. 22-322, NW of Harrisburg, May–Aug. 1981 and May–June 1982; Harrisburg (several sites), May–June 1980–1982. *Fayette Co.*, Conneville, 18 Aug. 1982. *Fulton Co.*, PA Turnpike, nr. Ft. Littleton, 25 June 1981. *Huntingdon Co.*, Greenwood Furnace, 21 July 1982, K. Valley coll. *Lancaster Co.*, Columbia, 22 July 1981. *Luzerne Co.*, Ashley and nr. Mountain Top, 4 Aug. 1983. *Northumberland Co.*, Watsonstown, 7 July 1982. *Somerset Co.*, E of Fairhope, 25 June 1981. *Susquehanna Co.*, Susquehanna, 30 July 1981. *Westmoreland Co.*, New Stanton, 18 Aug. 1982. *York Co.*, Rt. 15 nr. Dillsburg, 15 June 1980; Rt. 30 E of York, 22 July 1981. **Virginia:** *Augusta Co.*, I81N, Rest Area S of Weyers Cave exit, 5 July 1982. *Bath Co.*, SW of Millboro, 10 June 1984. *Carroll Co.*, I77N, 20 mi N of No. Car. state line, 5 July 1981. *Frederick Co.*, Winchester, 25 May 1981, G. C. Eickwort coll. *Highland Co.*, Rt. 678, S of McDowell, 10 June and 15 July 1984. *Rockbridge Co.*, I81S, 5 mi N of Lexington, 3 July 1980. *Smythe Co.*, I81S, nr. Marion, 15 July 1982. *Wythe Co.*, I77N, N of Carroll Co. line, 6 July 1980. **West Virginia:** *Berkeley Co.*, Rt. 11 N of Martinsburg, 2 July 1980 and 14 Aug. 1982; Inwood, 2 July 1982. *Greenbrier Co.*, 6 mi W of Lewisburg, 19 July 1978. *Hampshire Co.*, Rt. 50, 4 mi E of Romney, 14 Aug. 1982. *Hardy Co.*, Rt. 55, Baker, 9 June 1984. *Jefferson Co.*, Shepherdstown, 1 June 1980. *Pendleton Co.*, Rt. 220, S of Franklin, 9 June 1984; nr. Upper Tract, 14 July 1984.

CANADA. **Ontario:** *Grey Co.*, Mt. Forest and Owen Sound, 15 July 1983.

SEASONAL HISTORY AND HABITS

Although most adults of *D. echii* may overwinter in soil near rosettes of *E. vulgare* (Vayssieres, 1983), we collected adults, perhaps overwintering individuals, from Virginia pine (*Pinus virginiana* Mill.) during mid-April and early May. At the main sample area in 1981, adults appeared on *E. vulgare* foliage between 27 April and 5 May. Most occurred on lower leaf surfaces, but one mating pair was observed on the upper surface. By 15 May adults were more numerous; mating pairs and eggs were observed. A few eggs were placed in soft tissues of the upper or lower leaf surface, but most were inserted in midribs of the lower surface. As noted by Vayssieres, the

dark brown or black eggs are covered by a conelike, dark gummy substance. Opercula were either flush with the surface or projected about a millimeter. Eggs were more abundant by 20 May, and on 26 May some basal leaves were observed to harbor 50 or more eggs. In a nearby planting that already was in full bloom, eggs were found inserted in sepals.

Nymphs were not present at the sample site on 26 May, but eggs brought back to the laboratory began to hatch within 48 hours. A first-instar nymph was found on rosettes of a nearby colony of *E. vulgare* on 27 May. On 5 June overwintered adults were noticeably less abundant on the plants, eggs were still present, and nymphs, mostly second instars, were observed on flower buds and sepals. Within a week nymphs were restricted to the inflorescences, with instars I–IV present and third instars most numerous. By 18 June only two adults were seen, one probably representing a teneral specimen of the first generation. The nymphal population consisted mainly of fifth instars with third and fourth instars also present. The time required for production of adults in the field (about 35 days) compares well with a developmental time (egg to adult) of 32–38 days recorded in the laboratory at 19°C (Vaysieres, 1983).

On 23 June late-instar nymphs outnumbered first generation adults, which were present on plants with developing flower buds rather than on those with withered inflorescences. A week later adults were common, instars III–V of the first generation were still present, and eggs of a second generation were found in peduncles, bracts, and bracteoles with only a few in midribs of leaves subtending inflorescences. By 8 July first- and second-instar nymphs were common; the single fourth instar collected may have been a “straggler” from the first brood. The numbers of first generation adults appeared to have declined by 16 July; instars I–V were present with some of the late instars possibly representing a first generation. Nymphs of all stages again were present a week later, and first brood adults were now scarce. By 5 August second generation adults, some of them teneral, outnumbered nymphs of this generation (instars IV–V). Leaves subtending inflorescences appeared chlorotic and coated with dark spots of excrement. Most of the plants had turned brown; only a few blossoms remained. On 20 August only two adults and one fifth instar could be collected from the single plant still showing green leaves and bluish inflorescences. Whether second generation adults immediately enter soil near their hosts or disperse to other plants, e.g., pines, is not known. Adults were not found in soil samples taken under basal rosettes of *E. vulgare* at two sites during October.

Observations on *D. echii* made at irregular intervals in other years conformed generally to the 1981 seasonality. In 1982 mating pairs and a few eggs were present by 14 May at the main study site used the previous season; first instars were found on 26 May. At a nearby locality first instars of a second generation were present by 21 June. Plants at the study site had dried up by 20 August 1982, and no tingids were observed. In Pennsylvania adults of this bivoltine species were encountered only occasionally during mid- to late August. Adults and late instars have been collected on 31 August in Erie Co., New York.

The only natural enemy of *D. echii* found in our study was *Sinea diadema* (F.). On an inflorescence of *E. vulgare* an adult of this reduviid was observed feeding on a fifth-instar nymph. In France, Vayssieres (1983) observed another hemipteran

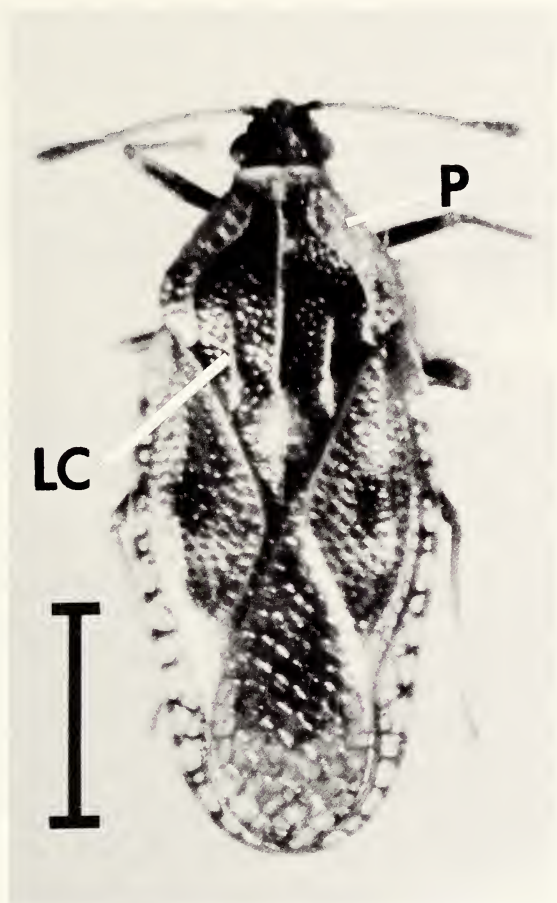


Fig. 1. Adult habitus of *Dictyla echii*. Labelled parts are paranotum (P) and lateral carina (LC); vertical bar = 1.0 mm.

predator, the anthocorid *Orius niger* (Wolff), attacking eggs and first instars of this tingid.

RECOGNITION FEATURES

Adults (Fig. 1) of *Dictyla echii*, the only recorded species of the genus *Dictyla* in North America, are easily recognized by the paranota that are broadly reflexed over the pronotum and the shortened lateral carinae of the pronotal disc. This elliptical species, measuring 3.3–3.8 mm long, is further characterized by the black head and pronotum, which strongly contrast with the yellow paranota. The hemelytra are ovoid with the lateral margins evenly convex, mottled dark brown and yellow. Antennal

segments 1 and 2 and the apical segment are black. The femora (except for the apex) and tarsi are dark brown, with the tibiae yellow. The venter is black.

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